IPM Plan Guide Sheet
Practices for Field Crop Production

Introduction

This tool has been designed as a guide for evaluating on-farm pest management practices for farmers interested in a Natural Resource Conservation Service (NRCS) 595 Integrated Pest Management (IPM) Plan. A 595 IPM plan is one of many practice standards offering financial assistance to farmers to adopt agriculture-minded conservation practices through the NRCS Environmental Quality Incentives Program (EQIP). This evaluation tool outlines industry standards of IPM that have been peer reviewed by universities, independent consultants, nongovernmental organizations, NRCS staff, and other state and federal agencies, and provides site specific information for implementing IPM.

EQIP is a voluntary conservation program with annual signup periods often offered in the winter. The applications are scored and funds are awarded competitively to applicants that propose cost-effective conservation practices, address local priorities, and provide the greatest environmental benefit. Contact your local USDA service center to find out specific signup dates for your state.

EQIP application information by state
http://www.nrcs.usda.gov/programs/eqip/EQIP_signup/2009_signup/index.html

Conservation plan application form – this is the required application form for applying for EQIP funds
Form CCC-1200 http://www.nrcs.usda.gov/programs/eqip/

What is IPM?

IPM is a comprehensive approach to managing pests that uses an array of practices that minimize impacts on the environment, while providing safe, effective and economical means of pest control. The principles and practices of IPM are applied to any setting where pests (e.g., insects, diseases, weeds, mammals, birds) are present. IPM practices have the added benefit of offering solutions to pest control that reduce the use of pesticides and protects resources by mitigating their impacts on the environment.

The fundamental principles of implementing IPM are as follows

1. **Pest identification:** Proper identification of pests is necessary to identify the best options for control.
2. **Pest biology:** Understand pest life cycles, natural hosts and enemies and environmental conditions that influence pest activity.
3. **Pest monitoring:** Scout or trap for pests and beneficial insects through the growing season, and keep records of all pest levels.
4. **Establish action and economic injury thresholds:** Thresholds are used to determine when pest infestation is severe enough to warrant control.
5. **Select appropriate treatment strategy:** IPM relies on cultural, mechanical, biological and chemical controls for prevention, suppression, or control of pest populations.
6. **Evaluate effectiveness of the pest management program:** IPM is not static; make changes that increase the level of IPM that is being practiced from year to year.

PAMS	PRACTICES	REFERENCES	Field Corn	Soybean	Alfalfa	Wheat
PREVENTION	Use certified insect, weed and disease-free-seeds when available.		Plant hybrids with resistance to leaf blight and stalk rots. If necessary, treat seeds with fungicide if there is a current history of fungal disease in the field.	Plant-disease-free seed with a germination rate of 80% or higher. If necessary, treat seeds with fungicide if there is a current history of fungal disease in the field.		If necessary, treat seeds with fungicide that controls seedling blights, bunt and loose smut.
	Prevent spread of new weeds by cleaning tillage equipment and combines.					
	Reduce moisture on plant surfaces to prevent disease incidence. (e.g., avoid overhead irrigation between 6 p.m. and midnight to minimize disease.)					
	Employ methods to avoid spreading pests (pathogens, weeds, and insects). (e.g., work crop when dry, work infested fields last, hose down equipment between fields, etc.)	Principles of Sustainable weed management[39]		Incorporate post-harvest residues if severe disease problems occurred during season from leaf diseases or brown stem rot. Tillage will improve surface drainage and reduce damage from Phytophthora root rot. Avoid transporting soybean cyst nematode with tillage equipment.		Incorporate residues from fields with heavy disease infestation during season.
	Destroy and/or remove crop residues for field sanitation procedures. Include fall tillage where appropriate to control weeds and break pest cycles.	NYS IPM Elements[1], Ohio IPM Elements[2]	Plow under corn refuses in the fall to control European corn borer.			
	Eliminate unmanaged plants that serve as pest reservoirs, such as abandoned crops, volunteers from previous crop, or weed hosts of viruses.			Control volunteer Bt corn to reduce the selection for resistance.		Destroy volunteer wheat, and other weed grasses to reduce inoculums of pathogens in wheat fields.
	Test soil or plant tissue annually to determine proper fertility and pH levels for crop and time application according to crop needs. Apply nutrients, fertilizers, and pH-adjusting agents according to recommendations.	Tri State Fertilizer Recommendations for corn, soybeans, wheat and alfalfa[40], Ohio IPM Elements[2]	If manure is applied, take nitrogen credits and reduce synthetic nitrogen fertilizer.	Maintain soil pH in the 6.5 to 7.0 range. Apply lime, if needed, six to 12 months before planting crop.	Maintain soil pH in the 6.5 to 7.0 range. Apply lime, if needed, six to 12 months before planting crop.	No more than 20 lbs of nitrogen are applied in the fall.

PAMS	PRACTICES	REFERENCES	Field Corn	Soybean	Alfalfa	Wheat
AVOIDANCE	Rotate crops that break the pest cycle. Do not plant crops from the same family at less than recommended intervals for the identified pest(s). Crop rotations must include crops with different life cycles to break life cycles of summer and winter annual weeds and perennial weeds. (Example, a corn soybean rotation is not much of a rotation because both are summer annuals.)	Ohio IPM Elements[2]	Rotate to crops other than corn.	Rotate soybean with corn or small grains; a two or three year rotation is adequate under most circumstances. At least three years may be necessary for high populations of soybean cyst nematode.	Rotate to corn or small grains, never follow alfalfa with alfalfa.	Never plant wheat after wheat or spelt. A two to three year rotation away from wheat is recommended.
	Match crops to appropriate sites to optimize plant health and avoid known pests. (e.g., avoid planting crops susceptible to fungal diseases in low wet fields.)			Treat seeds with fungicide if there is a current history of fungal disease in the field.		
	Plant pest and disease-resistant-seed.		Plant Bt corn if in an area that has a history of European corn borer. Plant varieties resistant to leaf blights and stalk rots	Plant varieties with resistance to *Phytophthora* root rot, *Sclerotinia* stem rot. Use soybean cyst nematode resistant varieties in conjunction with rotation to reduce nematode populations. Plant aphid resistant soybeans if soybean aphid history is present.	Plant winter hardy varieties with resistance to *Phytophthora* root rot, A*nthracnose*, *Verticillium* wilt and *Aphanomyces* root rot. Plant potato leaf hopper resistant varieties.	Select high yielding varieties with good straw strength, winter hardiness and resistance to the important diseases in your area. Plant Hessian fly-resistant varieties. Plant after Hessian fly safe date for your county.
	Adjust planting dates and select cultivars with maturity dates that allow avoidance of early or late-season pests.		Time seeding with adequate soil moisture for rapid germination and to prevent losses from crown, and root rot and seedling diseases.	Time seeding with adequate soil moisture for rapid germination and to prevent losses from crown, and root rot and seedling diseases.	For late summer no-till seeding, plant as early in August as possible to avoid seeding losses due to *Sclerotinia* crown and stem rot.	Avoid aphids and the virus they transmit by planting after the Hessian fly-free date of the region.

PAMS	PRACTICES	REFERENCES	Field Corn	Soybean	Alfalfa	Wheat
MONITORING	Monitor for pests as recommended for each crop. If no monitoring guidelines available, monitor weekly to determine presence, density, and locations of pests and to determine crop growth stage. Use pest-forecasting tools (e.g., computer modeling software) as additional guides for on-farm pest monitoring activities in conjunction with weather data to predict risk of pest infestation and optimize timing of control measures to proper life stage of targeted pest. **Record findings. Record keeping is required.** (Example: Scout crops and use other appropriate monitoring aids such as pheromone traps, disease diagnostic tests, etc. Map weeds in the fall to help plan where specific measures may be needed to target problem weeds the following spring.)	Pest Management Guidelines from University of Missouri[68], Field Crop IPM Resources from Illinois State University[62], Ohio IPM Elements[2], Economic Thresholds for Weeds[32], Pest Bulletins [55-61]	1. If western corn rootworm is suspected, place sticky traps in soybean fields and monitor to determine if beetles are dense enough to justify treatment the following year; 2. Scout fields for damage from leaf blight at tasseling; 3. Scout fields in the fall prior to harvest to determine level of stalk rot and harvest fields with greatest levels of stalk rot first to avoid losses due to lodged corn.		Scout weekly for alfalfa weevil during first and second cutting. Scout for potato leaf hopper on second and third cuttings. Control when populations reach economic threshold or cut early.	Scout fields from flag leaf emergence through flowering for powdery mildew, leaf rust, *Stagonospora nodorum* leaf and glume blotch.
	Use on-farm weather monitoring devices to measure precipitation, humidity, temperature, and leaf wetness and/or use commercial weather prediction service for prevention and control of plant diseases. (e.g., install weather station with rain gauge, hygrometer, maximum and minimum temperature recording equipment, leaf- wetness sensors.)					

PAMS	PRACTICES	REFERENCES	Field Corn	Soybeans	Alfalfa	Wheat
SUPPRESSION	**CULTURAL AND PHYSICAL CONTROLS**					
	Use cover crops, especially pest-suppressing crops (allelopathic), in the rotation cycle to reduce weeds and disease incidence and to improve soil quality.	See references 29-45 for cover crop guidance		Weed control is especially important, as weeds act as hosts for *Sclerotinia* white mold and soybean cyst nematode.		
	Plant using appropriate within- and between-row spacing optimal for crop, site, and row orientation. (e.g., use row spacing and plant densities that assure rapid canopy closure.)	Ohio IPM Elements[2] for crop-specific recommendations.		Narrow rows are best for weed suppression but worst for white mold, decision on this must be site specific considering disease pressure and history of disease incidence.		
	Use reduced tillage and other residue management practices to suppress weeds and maintain soil organic matter as appropriate for crop. Use no-till or conservation tillage systems to minimize pesticide movement from field with sediment loss.	See NRCS practice standards 329, 345, 346 for residue management.	Conserve organic matter with no-tillage or minimum tillage where feasible. Feasibility depends on soil texture, soil moisture and drainage, soil temperature and slope of the land.	Conserve organic matter with no-tillage or minimum tillage where feasible. Feasibility depends on soil texture, soil moisture and drainage, soil temperature and slope of the land.		Conserve organic matter with no-tillage or minimum tillage where feasible. Feasibility depends on soil texture, soil moisture and drainage, soil temperature and slope of the land.
	Prevent weeds from going to seed. (Example: Cultivate, pull, mow, flame, etc.)	*Flame weeding for agronomic crops*[37]				
	Inter-seed cover crop within or between rows to suppress weeds.					
	Use mechanical pest controls. (e.g., cultivate, mow, hoe, and hand remove insects and weeds)					
	Use physical pest controls and deterrents. (e.g., noise-makers, reflectors, ribbons and predator models.)	Bio-control of insects and mites [13] Natural enemies in fieldcrops[14]				

PAMS	PRACTICES	REFERENCES	Field Corn	Soybeans	Alfalfa	Wheat
	Maintain or improve soil aeration and drainage to avoid standing water and minimize plant disease. (Example: Use tile drainage, sub soiling, grassed waterways, raised beds, and organic matter additions. Avoid planting in low and wet spots in field.)	.		Improved drainage will reduce damage caused by P*hytophthora* and other seedling diseases		
	BIOLOGICAL CONTROLS					
SUPRESSION	Use insect mating disruption devices, if available.					
	Conserve naturally occurring biological controls. (e.g., select pesticides and time applications to minimize impact on beneficial, use floral perimeter crop to attract and support beneficial insects.)	Natural Enemies in Field Crops[14], Environmental Impact of Pesticides (EIQ)[47], Biological Control of Insects and Mites [13]				
	Release beneficial organisms where appropriate. (e.g., release predatory mites for control of two-spotted mites and thrips.)	Biological Control of Insects and Mites [13]				
	Use compost as a soil amendment to increase biological diversity in soil and plant health and suppress plant disease.	Ohio IPM Elements [2]				
	CHEMICAL CONTROLS					
	Minimize chemical use, do not mix pesticides of different types (e.g. insecticide, fungicide, herbicide) unless thresholds for all pesticides are reached at the same time. Correct timing and early season control (lower rates with smaller weeds) is important. Use in conjunction with accurate pest identification and monitoring, action thresholds, to avoid weed competition and crop damage, use alternative suppression tactics (biological, cultural, etc), and judgments based on previous year's weed map and/or pest scouting records. (e.g., use pheromone traps to monitor for corn earworm in sweet corn.) Use appropriate adjuvants for the selected pesticide to maximize efficacy without increasing pesticide rate.	Weed Control Guide For Field Crops [44] Ohio IPM Elements[2], Economic Threshold for Weeds[32]	Herbicide programs and rates are selected on a field-by-field basis, based on tillage, soil factors, and knowledge about weed populations. Spot or re-spray herbicide treatments are based on available economic threshold and weed interference information[7].	Spot or re-spray herbicide treatments are based on available economic threshold and weed interference information.	Monitor viability of alfalfa stand to determine whether herbicide application is justified, or if the field should be rotated to another crop. Broadcast or spot herbicide treatments are based on available economic threshold and weed interference information.	

PAMS	PRACTICES	REFERENCES	Field Corn	Soybeans	Alfalfa	Wheat
	Select pesticides, formulations, and adjuvants based on least negative effects on environment, beneficial (e.g., pollinators, predators, parasites), resistance management and human health in addition to efficacy and economics.	See environmental cautions on pesticide label and Environmental Impact of Pesticides (EIQ)[47]				
	Use lowest labeled rate that is effective based on species, size, soil type,, scouting results, and Extension-recommended action thresholds for target pest.	Contact state NRCS or Extension office for spray record keeping forms.				
SUPPRESSION	Limit applications to partial fields or banding to reduce quantity or impact of pesticide. (e.g., spot treat where pests are found or use banding, seed, edge or field perimeter/border treatments.) Based on scouting.	NYS IPM Elements [1] Ohio IPM Elements[2] Mass IPM Guide Lines[3] Economic Thresholds for Weeds[32]		Herbicide programs and rates are selected on a field-by-field basis, based on tillage, soil factors, and knowledge about weed populations.	Herbicide programs and rates are selected on a field-by-field basis, based on tillage, soil factors, and knowledge about weed populations.	Herbicide programs and rates are selected on a field-by-field basis, based on tillage, soil factors, and knowledge about weed populations.
	Calibrate sprayers or applicators prior to use to ensure uniform application and verify amount of material applied. (Use water sensitive cards to measure spray pattern.)	Pesticide Calibration Guide[46]				
	Use pesticide-resistance management strategies as appropriate and where required on pesticide label. (e.g., alternate applications of chemicals with different modes of action to avoid development of pest resistance.)	Managing Pest Resistance to Pesticides[48]				
	Use specialized pesticide application equipment to reduce chemical drift and excess chemical application. (e.g., use wiper applicators, digitally controlled adjustable tool bars, double-drop sprayers, laser guided precision sprayers, low-drift nozzles, drift reduction adjuvant, shielded applicators or air induction booms etc.)					
	Use direct injection sprayers to reduce risk of tank contamination and crop injury.					
	Use spray-monitoring equipment along with sprayer technology to minimize pesticide use, overlaps, and overspray. (e.g. swath bars, GPS guidance systems, auto steer, wind meter to accurately measure wind speed, water-sensitive cards to measure drift.)					

PAMS	PRACTICES	REFERENCES	Field Corn	Soybeans	Alfalfa	Wheat
	Use vegetative buffers, set-backs, or filter strips to minimize chemical movement to sensitive areas such as surface waters, schools, residences, and neighboring crops.					
	Use mitigation practices as necessary in accordance with pest monitoring results, pest predictions, action thresholds, and WinPST output.					
	Pesticide applicator must be properly licensed and certified when using restricted use pesticides or when doing custom pesticide applications for hire. Contact state pesticides regulatory agency for license and certification requirements.					
	NOTE: Additional pesticide use requirements from the 595 Practice Standard:	***NOTE:** See documents listed in the attached resource list for additional guidance.				
	> Always follow all pesticide label instructions and environmental cautions.					
	> Store, handle, transport, mix, use, and dispose of pesticides and pesticide containers per state pesticides regulatory agency recommendations and regulations.					
	> Follow state and federal worker protection standards.					
	> When drawing water for pesticide mixing from any surface waters of the state, use anti-siphoning devices and do not use hoses that have been in contact with pesticides.					
	> Do not mix or load pesticides within 50 ft from the high water mark of any surface waters of the state.					

IPM Practices Resource List

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